

**REMARKS**

Applicants thank the Examiner for examining the application. Applicants have canceled claims 54, 84, and 87-109. Applicants have amended claims 27 and 110, as described further below. Applicants have also amended claims 1, 27, 53, and 110, as further described below. Finally, Applicants have added new claims 137-140. Support for new claims 137-140 may be found throughout the specification, and particularly at page 11 lines 24-27, and the addition of new claims 137-140 does not constitute the addition of new matter. With the amendment, claims 1-2, 5-6, 7-16, 18, 20-30, 32-53, 55-58, 61-83, 110-111, and 114-140 are now pending.

*Claim Rejections – 35 U.S.C. § 101*

The Examiner rejected claims 27-30, 32-54, 57-58, 61-84, 87-111, and 114-136 under 35 U.S.C. § 101 because the invention is directed non-statutory subject matter.

According to the Examiner, claims 27-30, 32-52, 57, 110-111, and 114-136 "recite a "system" but lack the necessary physical articles or objects to constitute a machine or a manufacture within the meaning of 35 U.S.C. § 101," and "are, at best, functional descriptive material *per se*". Office Action pages 2-3. Applicants strongly disagree with this assertion, but to overcome the rejection, have amended independent claims 27 and 110 to recite that at least one element of these claims includes a hardware component, namely a processor. As Applicants' dependent claims 28-30, 32-52, 57, 111, and 114-136 depend from Applicants' amended independent claims 27 and 110, these dependent claims also include the processor element. Thus, the rejection for all of these claims is traversed, and the rejection should be removed. Applicants thank the Examiner for his guidance in responding to this rejection.

According to the Examiner, claims 53, 58, and 61-83 are not limited to tangible embodiments, due to Applicants' disclosure in the specification on page 32, lines 10-17 of both tangible embodiments and intangible embodiments. Applicants have amended the specification to remove the intangible embodiments, as shown above in the

Amendments to the Specification. Thus, the rejection is traversed and should be removed.

According to the Examiner, claims 54, 84, and 87-109 are directed towards an intangible embodiment, namely, "a computer data signal embodied in a carrier wave". Applicants have canceled claims 54, 84, and 87-109, and thus the rejection should be removed.

*Claim Rejections – 35 U.S.C. § 102(e)*

The Examiner rejected claims 27-30, 32-38, 44-46, and 48-52 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,266,658 to Adya et al.

Applicants amended independent claim 27 requires, among other things, that the solution refiner further generates at least one new candidate index solution by eliminating at least one index on a small table under evaluation, wherein the at least one index does not enforce an integrity constraint, wherein the integrity constraint describes a condition about the database that must always be true or must always be false. The Examiner cited to col. 2 lines 55-65, Fig. 7, and col. 11 lines 13-30 of Adya et al. as disclosing this limitation.

However, the cited text of Adya et al. fails to disclose a solution refiner that further generates at least one new candidate index solution by eliminating at least one index on a small table under evaluation, wherein the at least one index does not enforce an integrity constraint, wherein the integrity constraint describes a condition about the database that must always be true or must always be false, as required by Applicants' amended independent claim 27. None of the cited text of Adya et al. - indeed **none** of the entirety of the text of Adya et al. - discloses an integrity constraint as defined in Applicants' amended independent claim 27. The Examiner seems to be arguing that because Adya et al. does not disclose an integrity constraint, thus Adya et al. discloses that the at least one index does not enforce an integrity constraint. Applicants strongly disagree with this argument. For a rejection under § 102, as the Examiner knows, the cited reference must disclose each and every element that is claimed. Here, Adya et al.

is silent on integrity constraints, and under § 102, silence is not sufficient to show an anticipatory disclosure.

The Examiner has therefore failed to show that Adya et al. discloses a solution refiner that further generates at least one new candidate index solution by eliminating at least one index on a small table under evaluation, wherein the at least one index does not enforce an integrity constraint, wherein the integrity constraint describes a condition about the database that must always be true or must always be false, as required by Applicants' amended independent claim 27, and thus, for at least the reasons given above, Applicants' amended independent claim 27 is allowable over Adya et al.

Applicants' dependent claims 28-30, 32-38, 44-46, and 48-52 all depend from Applicants' allowable amended independent claim 27. Therefore, for at least the reasons given above, Applicants' dependent claims 28-30, 32-38, 44-46, and 48-52 are themselves allowable over Adya et al.

*Claim Rejections – 35 U.S.C. § 103(a)*

The Examiner next rejected claims 1-2, 5-6, 8-12, 16, 18, 20, 22-24, 26, 53-54, 56, 58, 62-64, 66-70, 74, 76-77, 79-81, 83-84, 88-90, 92-96, 100, 102-103, 105-107, 109-111, 115-117, 119-123, 127, 129-130, 132-134, and 136 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,960,432 to Chaudhuri et al. (Chaudhuri et al. I) in view of U.S. Patent No. 6,223,171 to Chaudhuri et al. (Chaudhuri et al. II).

Applicants' amended independent claim 1 requires, among other things, terminating the repeated execution when at least one candidate index solution is found that adheres to user-imposed constraints and no further indexes can be removed from said candidate index solution without degrading performance of the workload and **without disabling an integrity constraint**, wherein the integrity constraint describes a condition about the database that must always be true or must always be false (emphasis added). The Examiner cited to col. 15 lines 35-64 and col. 23 line 25 to col. 24 line 6 of Chaudhuri et al. II as disclosing this limitation.

As the Examiner knows, MPEP § 2143 requires, among other things, that to make a *prima facie* case of obviousness, the cited reference(s) teach or suggest every limitation in the claim.

However, the cited text of Chaudhuri et al. II fails to teach or suggest terminating the repeated execution when at least one candidate index solution is found that adheres to user-imposed constraints and no further indexes can be removed from said candidate index solution without degrading performance of the workload and without disabling an integrity constraint, wherein the integrity constraint describes a condition about the database that must always be true or must always be false, as required by Applicants' amended independent claim 1. In col. 15 lines 35-64, Chaudhuri et al. II teaches evaluating a workload W with respect to a hypothetical configuration having a hypothetical set of indexes  $\{I_1, I_3\}$  and a table size of ten million rows; see col. 15 lines 26-34. This evaluation is performed by creating the hypothetical index  $I_3$ , see col. 15 lines 35-37, and then running a query optimizer for each query in the workload W to obtain a cost estimate and index usage for each query with respect to the hypothetical configuration, so that the estimated cost of the whole workload W may then be determined by summing the cost estimation returned for each query; see col. 15 lines 48-58. In other words, a repeated process is terminated, but only when there are no more queries left for the query optimizer to process. The repeated process that is terminated is not a process that derives a candidate index set, as required by Applicants' amended independent claim 1, but rather one that evaluates queries given **an already-existing** index set (emphasis added). Further, the repeated process is not terminated when at least one candidate index solution is found that adheres to user-imposed constraints and no further indexes can be removed from said candidate index solution without degrading performance of the workload and without disabling an integrity constraint, as required by Applicants' amended independent claim 1.

In col. 23 line 25 to col. 24 line 6, Chaudhuri et al. II teaches a process used twice by a database administrator to determine which columns in which tables are good candidates for indexing, as described above. The database administrator terminates the process, but does so because he/she has found a configuration that improves the

cost of running the workload; see col. 23 line 64 to col. 24 line 6. The database administrator has **not** terminated the repeated execution when he/she found at least one candidate index solution that adheres to user-imposed constraints **and** no further indexes can be removed from said candidate index solution without degrading performance of the workload **and** without disabling an integrity constraint, wherein the integrity constraint describes a condition about the database that must always be true or must always be false, as required by Applicants' amended independent claim 1. Indeed, the cited text of Chaudhuri et al. II **does not teach or suggest removing any indexes from a candidate index solution**, as required by Applicants' amended independent claim 1. Further, the text of Chaudhuri et al. II makes no mention whatsoever, and also no suggestion, of integrity constraints as defined in Applicants' amended independent claim 1, and thus Chaudhuri et al. II cannot teach or suggest terminating the repeated execution when at least one candidate index solution is found that adheres to user-imposed constraints and no further indexes can be removed from said candidate index solution without degrading performance of the workload and **without disabling an integrity constraint**, wherein the integrity constraint describes a condition about the database that must always be true or must always be false (emphasis added), as required by Applicants' amended independent claim 1.

Therefore, for any of the the reasons given above, Chaudhuri et al. I and Chaudhuri et al. II, either alone or in combination, fail to teach or suggest all of the elements of Applicants' amended independent claim 1. Thus, Applicants' amended independent claim 1 is allowable over the combination of Chaudhuri et al. I and Chaudhuri et al. II.

Applicants amended independent claims 53 and 110 include limitations similar to those of Applicants' allowable amended independent claim 1. Therefore, for at least the reasons given above with regard to Applicants' allowable amended independent claim 1, Applicants' amended independent claims 53 and 110 are themselves allowable over Chaudhuri et al. II, and thus are allowable over the combination of Chaudhuri et al. I with Chaudhuri et al. II.

Applicants' dependent claims 2, 5-6, 8-12, 16, 18, 20, 22-24, 26, 56, and 137 depend from Applicants' allowable amended independent claim 1. Applicants' dependent claims 58, 62-64, 66-70, 74, 76-77, 79-81, 83, and 139 depend from Applicants' allowable amended independent claim 53. Applicants' dependent claims 111, 115-117, 119-123, 127, 129-130, 132-134, 136, and 140 depend from Applicants' allowable amended independent claim 110. Applicants' amended independent claims 1, 53, and 110 are all allowable over the combination of Chaudhuri et al. I with Chaudhuri et al. II for any of the reasons given above. Therefore, all of these dependent claims, which depend from Applicants' allowable amended independent claims 1, 53, and 110, respectively, are themselves allowable over the combination of Chaudhuri et al. I with Chaudhuri et al. II.

The Examiner next rejected claims 7, 65, 91, and 118 under 35 U.S.C. § 103(a) as being unpatentable over Chaudhuri et al. I in view of Chaudhuri et al. II and further in view of U.S. Patent No. 5,924,088 to Jakobsson et al.

The Examiner also rejected claims 13-15, 71-73, 97-99, and 124-126 under 35 U.S.C. § 103(a) as being unpatentable over Chaudhuri et al. I in view of Chaudhuri et al. II and further in view of U.S. Patent No. 6,003,022 to Eberhard et al.

The Examiner also rejected claims 17, 75, 101, and 128 under 35 U.S.C. § 103(a) as being unpatentable over Chaudhuri et al. I in view of Chaudhuri et al. II and further in view of U.S. Patent No. 5,404,510 to Smith et al.

The Examiner also rejected claims 21, 78, 104, and 131 under 35 U.S.C. § 103(a) as being unpatentable over Chaudhuri et al. I in view of Chaudhuri et al. II and further in view of U.S. Patent No. 6,021,405 to Celis et al.

The Examiner also rejected claims 25, 82, 108, and 135 under 35 U.S.C. § 103(a) as being unpatentable over Chaudhuri et al. I in view of Chaudhuri et al. II and further in view of Adya et al.

The Examiner next rejected claims 55, 61, 87, and 114 under 35 U.S.C. § 103(a) as being unpatentable over Chaudhuri et al. I in view of Chaudhuri et al. II and further in view of Gurry et al. ("Oracle Performance Tuning").

Applicants' dependent claims 7, 13-15, 17, 21, 25, and 55 depend from Applicants' allowable amended independent claim 1. Applicants' dependent claims 61, 71-73, 75, 78, and 82 depend from Applicants' allowable amended independent claim 53. Applicants' dependent claims 114, 118, 124-126, 128, 131, and 135 depend from Applicants' allowable amended independent claim 110. Applicants' amended independent claims 1, 53, and 110 are all allowable over the combination of Chaudhuri et al. I with Chaudhuri et al. II for any of the reasons given above. Therefore, Applicants' dependent claims 7, 13-15, 17, 21, 25, 55, 61, 71-73, 75, 78, 82, 114, 118, 124-126, 128, 131, and 135 are themselves all allowable over the combination of Chaudhuri et al. I and Chaudhuri et al. II. Applicants' dependent claims 7, 13-15, 17, 21, 25, 55, 61, 71-73, 75, 78, 82, 114, 118, 124-126, 128, 131, and 135 are thus allowable over the various combinations listed above, all of which include Chaudhuri et al. I and Chaudhuri et al. II.

The Examiner also rejected claims 39-41 under 35 U.S.C. § 103(a) as being unpatentable over Adya et al. in view of Eberhard et al.

The Examiner also rejected claim 43 under 35 U.S.C. § 103(a) as being unpatentable over Adya et al. in view of Smith et al.

The Examiner also rejected claim 47 under 35 U.S.C. § 103(a) as being unpatentable over Adya et al. in view of Celis et al.

The Examiner also rejected claim 57 under 35 U.S.C. § 103(a) as being unpatentable over Adya et al. in view of Gurry et al.

The Examiner also rejected claim 42 under 35 U.S.C. § 103(a) as being unpatentable over Adya et al. in view of Finkelstein et al. ("Physical Database Design for Relational Database").

Applicants' dependent claims 39-41, 42, 43, 47, and 57 all depend from Applicants' allowable amended independent claim 27. For at least the reasons given above, Applicants' allowable amended independent claim 27 is allowable over Adya et al. Therefore, Applicants' dependent claims 39-41, 42, 43, 47, and 57 are themselves allowable over Adya et al., and are also allowable over any combination of references

that includes Adya et al. Applicants' dependent claims 39-41, 42, 43, 47, and 57 are thus allowable over the various combinations listed above, all of which include Adya et al.

**CONCLUSION**

Applicants believe this Amendment and Response to be fully responsive to the present Office Action. Thus, based on the foregoing Remarks, Applicants respectfully submit that this application is in condition for allowance. Accordingly, Applicants request allowance of the application.

Applicants hereby petition for any extension of time required to maintain the pendency of this case. If there is any fee occasioned by this response that is not paid, please charge any deficiency to Deposit Account No. 50-3735.

Should the enclosed papers or fees be considered incomplete, Applicants respectfully request that the Patent Office contact the undersigned collect at the telephone number provided below.

Applicants invite the Examiner to contact the Applicants' undersigned Attorney if any issues are deemed to remain prior to allowance.

Respectfully submitted,



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